

## Cancer Nanotechnology Podcast

*CR correspondent Kevin Begos talks to Dr. Anna Barker, the National Cancer Institute's Deputy Director and Deputy Director for Advanced Technologies and Strategic Partnerships about how tiny technologies may help in the diagnosis and treatment of cancer*

KEVIN BEGOS: Cancer can be a huge challenge to doctors and patients but new hope for better diagnosis and treatment may come from something very small – nanotechnology. It sounds like a word from a science fiction movie, but has a very precise meaning. A nanometer is 1 billionth of a meter and nanotechnology is the science of building things on an incredibly small scale. For comparison, a human hair is about 50,000 nanometers in diameter, so nanotechnology may give doctors a way to target cancer cells with the least amount of damage to surrounding tissue or other parts of the body. I'm Kevin Begos for CR Magazine and in this month's podcast we talked to Anna Barker, Deputy Director for Advanced Technologies and Strategic Partnerships at the National Cancer Institute.

DR. BARKER: It basically takes advantage of size to better diagnose, treat, prevent and ultimately monitor patients with cancer. The reason that nanotechnology is so important is that it actually develops interventions that can get into cells that can actually interrogate cells, at a level from 1 to 100 nanometers.

KEVIN BEGOS: If you're still having trouble with the concept of nanotechnology consider this – each cell in the human body has a variety of functions going on inside, just like all the parts that are hidden under the hood of an automobile. The challenge with cells and cancer is to find out exactly what part of the organism has gone awry. By literally getting inside cells, nanoparticles may lead to both better diagnosis and treatment of cancers.

DR. BARKER: The fact is that we are composed of nanomachines. Everything that goes on in your body from DNA and the translation of DNA, through the proteins that actually run your body, those are all nanomachines that actually do that. So really what we are doing with nanotechnology is really taking a leaf out of nature's book. We are building little nanomachines to get very specifically to a cell, to either start or stop a process. That opens up a whole new world of opportunities in terms of developing new drugs, diagnosing cancer and actually monitoring patients that are actually on treatment.

KEVIN BEGOS: The tiny nanoparticles can also be used as markers to help doctors identify tumors at the earliest stages.

DR. BARKER: So if you look at nanotechnology, and one of the earliest wins in nanotechnology, which is occurring as we speak, and being used pretty broadly already, is the use of nanoparticles to enhance images. This allows us to go very, very deep into tissues, by using nanotechnology, which allows you then to do functional imaging, where you can actually track particles right to the site of the tumor. That's a very powerful approach to technology. You'll be able to find

tumors much, much sooner. If we find them sooner, then we believe that we'll be able to intervene, especially with surgery and radiation, much sooner.

KEVIN BEGOS: Barker says nanotechnology is rapidly moving out of the lab and towards helping people.

DR. BARKER: Well, actually, it's not so far away. As a matter of fact, if you look just in this last year, Dr. Robert Langer, at MIT, and his colleagues, have reported on targeted therapies that are directed toward prostate tumors. It can take something like Taxol and deliver it very, very specifically to prostate tumors. In the experiments that he's reported so far, these conjugates were taken up by the prostate cancer cells very specifically, not the normal cells, and basically it resulted in the complete reduction of the tumor in animals, with 100% survival over a very long period of time. It was an incredible enhancement over just giving Taxol to the animals alone. We're moving forward to put this into patients now – Dr. Langer is – so these new nanotechnologies are going to get into patients fairly quickly and you can deliver drugs much better with nanotechnologies than we've ever dreamed of before. The drugs we have, if we could just get them to the tumor cells, and not kill the normal cells, than we would have patients living a great deal longer, with a much higher quality of life, and that's what nanotechnology can do for us.

KEVIN BEGOS: The tiny scale of nanotechnology allows even more possibilities. Barker says that nanoparticles could contain several components and essentially do different jobs at the same time.

DR. BARKER: That means you could put something like a biosensor on one of these technologies, along with a targeted drug, and then something to report back, in the way of imaging on the same particle. So in theory you will, over time, make these particles and these nanotechnologies that will take care of all these functions for patients in one technology.

KEVIN BEGOS: I'm Kevin Begos for CR Magazine which is published by the American Association for Cancer Research. You can subscribe or find out more about CR by visiting our website at [www.crmagazine.org](http://www.crmagazine.org).